

# **SATELLITE TECHNOLOGY CONTRIBUTION TO WATER AND FOOD SECURITY**

Molly E. Brown, NASA

# Global Environmental Change and Food Security

**Food security** is the ability of all people to attain sufficient food for an active and healthy life.

- ⦿ Despite having the technical capacity to solve the problem, there continues to be many food insecure people in the world
- ⦿ Trends that contribute
  - Population growth
  - Energy Costs
  - Geopolitical disparities
  - Distribution of natural resources, particularly water
  - Climate: changing water cycle, increasing temperatures
- ⦿ Global monitoring of food resources needs global observations – satellites

# WORLD HUNGER



Undernourished

>35%   20-34%   5-19%   2.5-4%   <2.5%

Category	1	2	3	4	5		
Undernourished	>35%	20-34%	5-19%	2.5-4%	<2.5%	no data	incomplete data
Description	Very high	Moderately high	Moderately low	Very low	Extremely low		



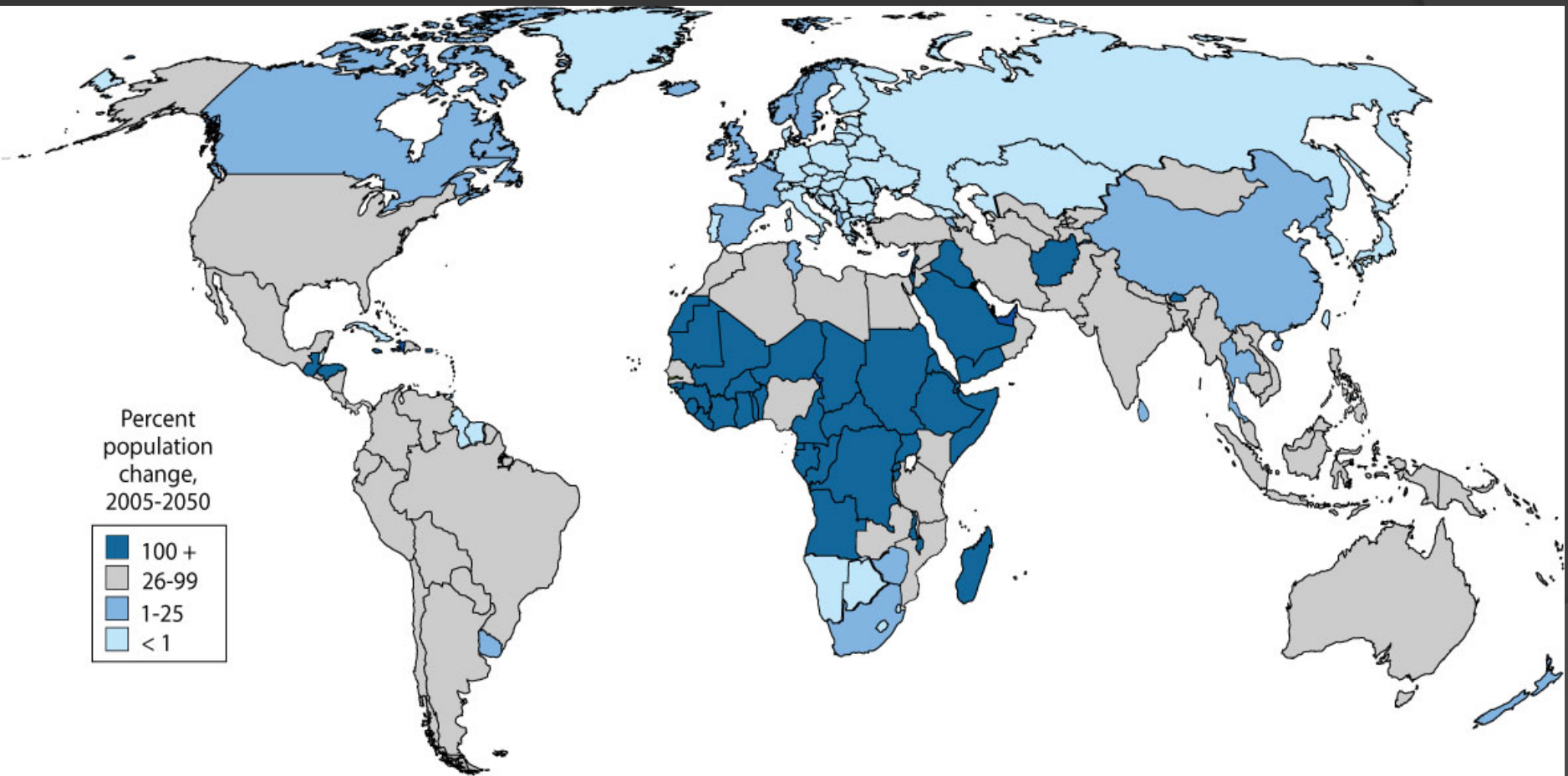
**World Food Programme**

Feeding The World's Hungry

Source: The State of Food Insecurity in the World 2002, Food and Agriculture Organization of the United Nations  
© 2002 United Nations World Food Programme

[www.wfp.org](http://www.wfp.org)

# Projected Population Change, 2005-2050



Source: Population Reference Bureau, *2005 World Population Data Sheet*.



# Food security – more than just agricultural production

## ⦿ Food utilization

- Ability to derive nutrition from the food you eat
- Analysis at individual scale

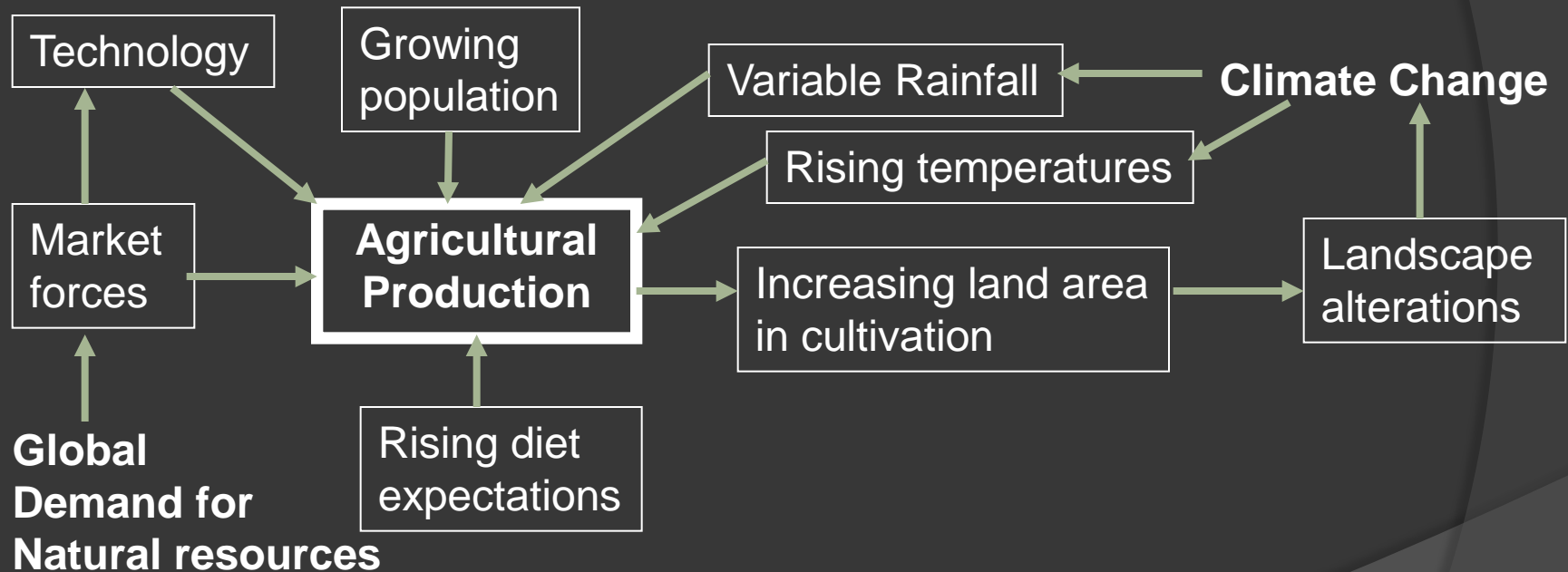
## ⦿ Food availability

- How much food is produced in a region
- Analysis at household, community scale

## ⦿ Food access

- Cost of food and affordability to the poorest
- Analysis at community and region scale

# Food Demand, Markets and Ecosystems: Climate Change in Africa



As populations and incomes rise, the global demand for food will also grow – probably roughly doubling by 2050 and shifting towards more water-demanding diets.

# Africa is No Longer Self-Sufficient in Food

Cereal yields on the continent are roughly one metric ton of grain per hectare of cultivated land, a figure little changed from 50 years ago and roughly one third of the yields achieved on other continents.



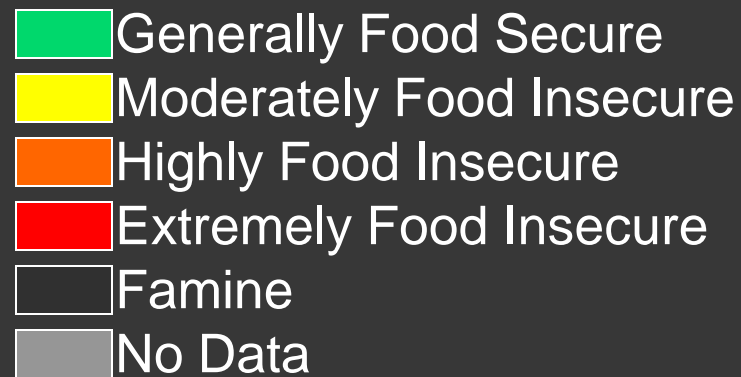
Lack of technology (irrigation, Improved seeds, fertilizer) means that African agriculture is far more weather-dependent than US Agriculture – and its people more vulnerable to food insecurity due to increasing food prices.



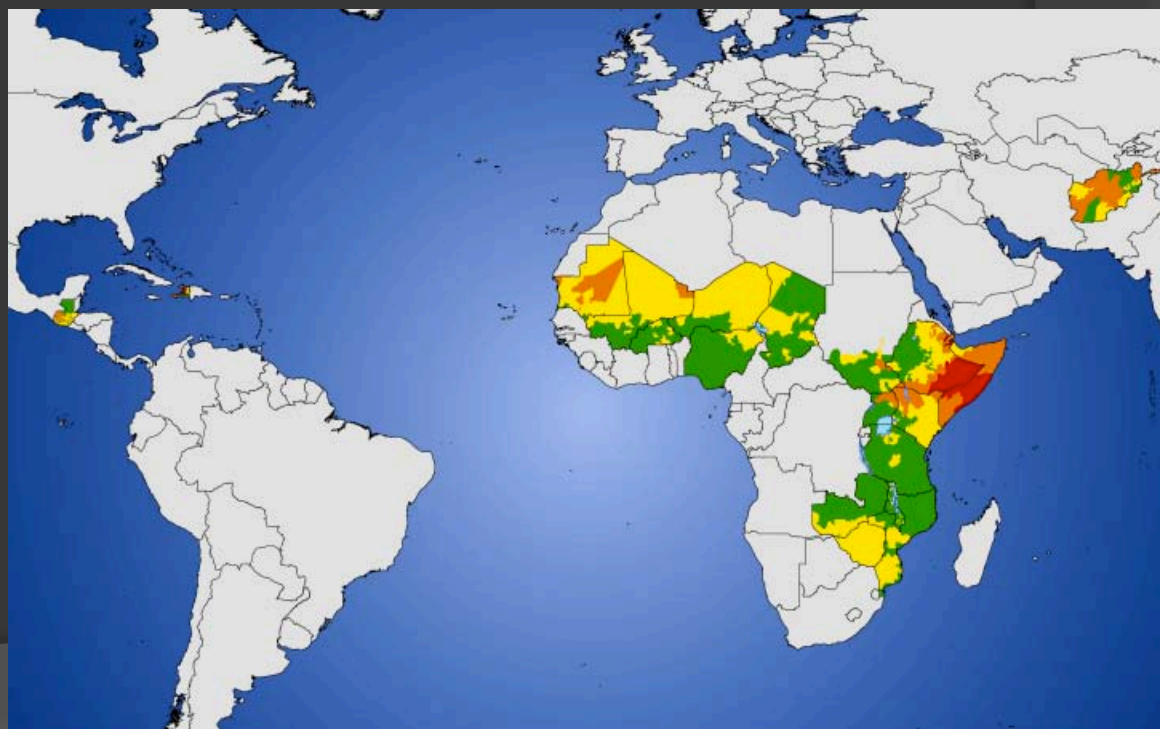
# The Famine Early Warning Systems Network

**FEWS NET** is a USAID-funded activity that works to strengthen the abilities of countries and regional organizations to manage risk of food insecurity through the provision of timely and analytical early warning and vulnerability information.

Oct-Dec 2008



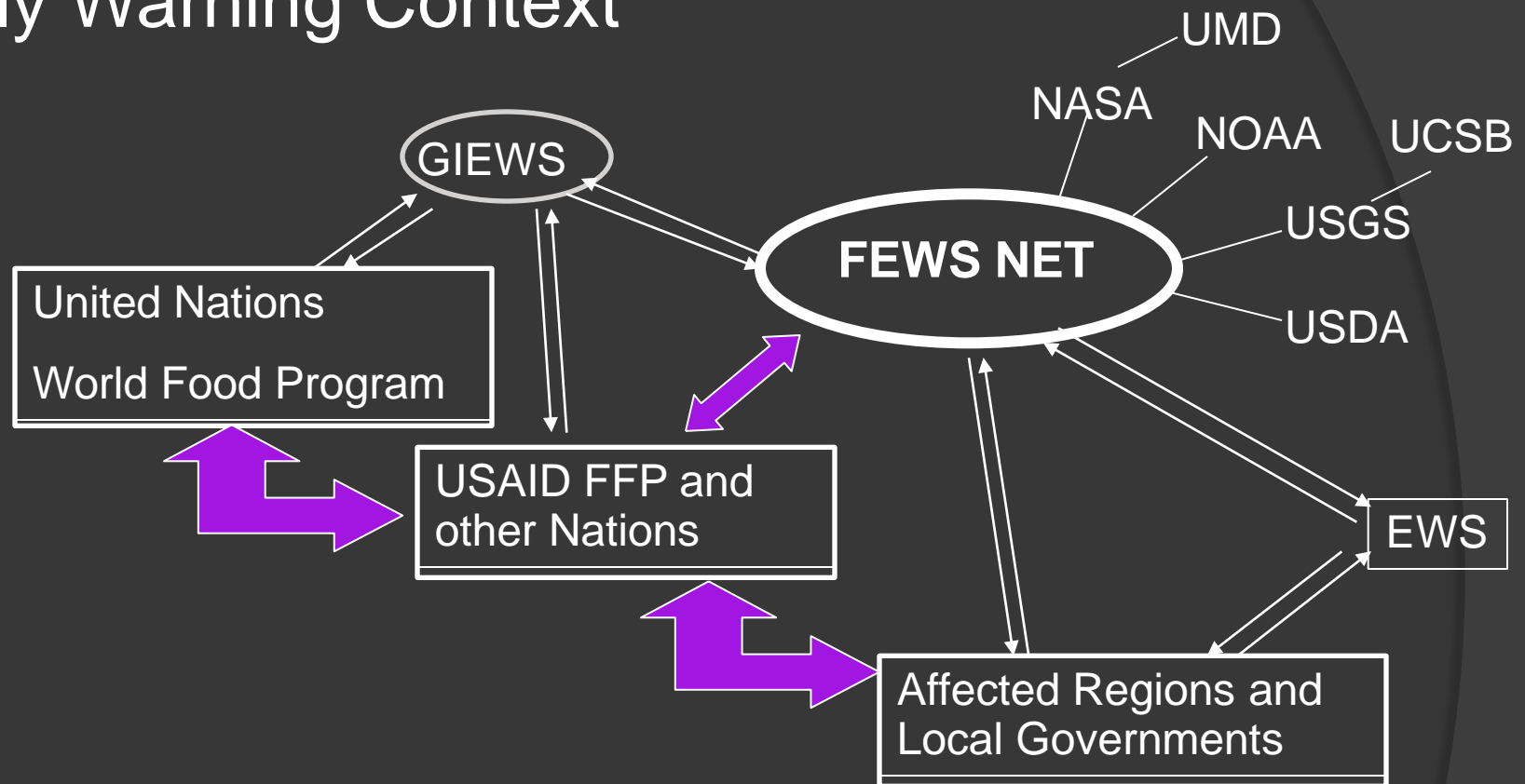
Geographic Extent of  
FEWS NET's 23 countries







# Early Warning Context



**'Early Warning' (EW) programs provide Information so Governments can respond to Food Security problems before lives or livelihoods are lost.**

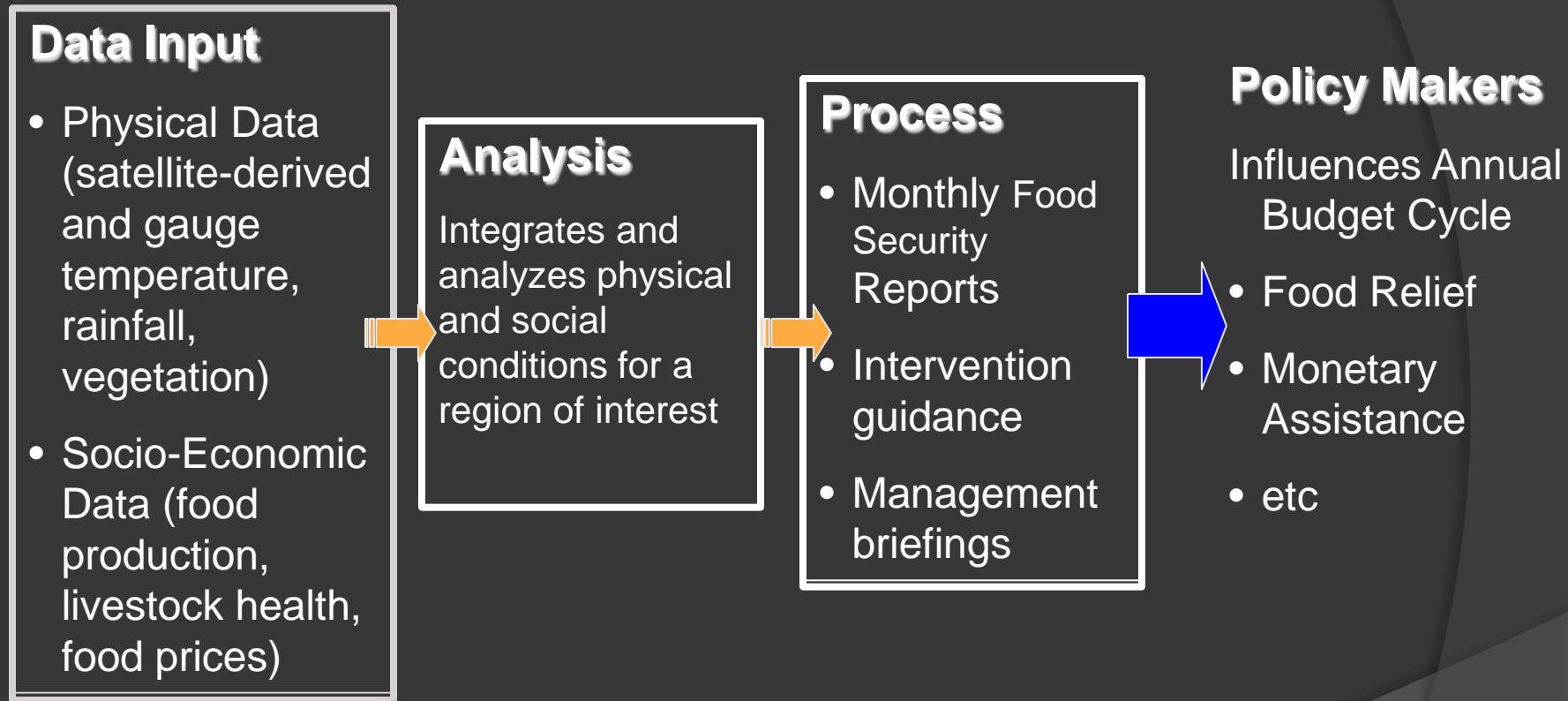
Legend:

**GIEWS:** Global information and early warning system

**EWS:** Local Early Warning Systems

**FEWS NET:** Famine Early Warning System Network

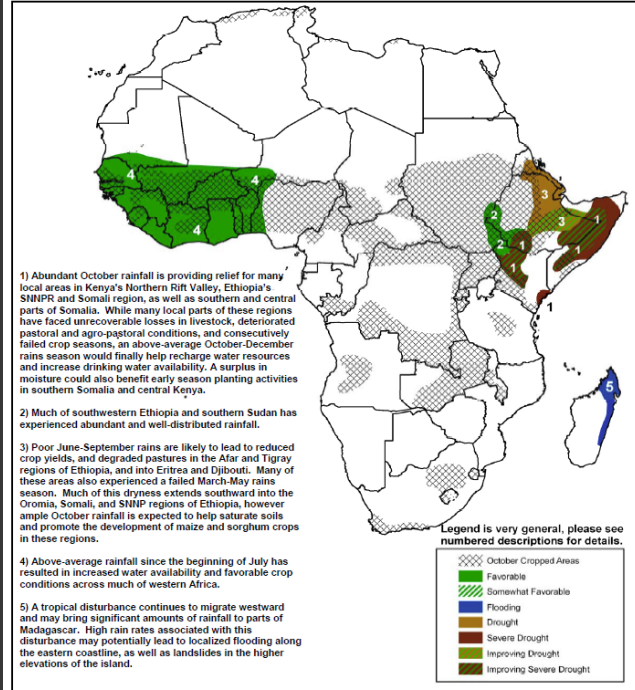
# FEWS NET process



FEWS NET operates in a complex, consensus based decision making environment.



- In the last seven days, consistent rains were observed across many parts of southern and eastern Ethiopia, Somalia and northeastern Kenya. As rainfall totals remain above-average for the October-December season, anomalous moisture continues to replenish water resources, and is beginning to improve areas impacted by long-term drought.
- Tropical activity in the Indian Ocean basin is expected to bring increased moisture to parts of the Greater Horn and Southern Africa. An anomalously early season cyclone developing in the southern Indian Ocean may result in significant amounts of rain and potential localized flooding along eastern portions of Madagascar.



# Diversified and targeted information products

## And an integrated early warning information system....



Country Reports

Regional Reports

Executive Overview

Alert State

Market/Trade Information

**ETHIOPIA NETWORK on food security**

Monthly Report

Highlights

Henington Epidemic Threatens 6.9 Million People

As a result of Henington, which began in September 2008, the network has been... (text continues)

Figure 1: Henington Epidemic Threatens 6.9 Million People

Figure 2: Henington Epidemic Threatens 6.9 Million People

Figure 3: Henington Epidemic Threatens 6.9 Million People

**FEWS NET**

Famine Early Warning Systems Network

Executive Overview of Food Security Threats in April 2004

Summary

The 2003/04 season has been a very challenging one for southern African agriculture with... (text continues)

Regional Performance Improves Over the January - March Period

The 2003/04 season has been a very challenging one for southern African agriculture with... (text continues)

**FEWS NET**

Executive Overview of Food Security Threats in April 2004

Alerts: Food Insecurity in Africa

Figure 1: Food Insecurity in Africa

Figure 2: Food Insecurity in Africa

Figure 3: Food Insecurity in Africa

**FEWS NET**

Le Tchad: Alerte d'urgence alimentaire

Sans une aide accrue, la famine menace les réfugiés soudanais

Une violence croissante entrave la distribution de l'aide humanitaire

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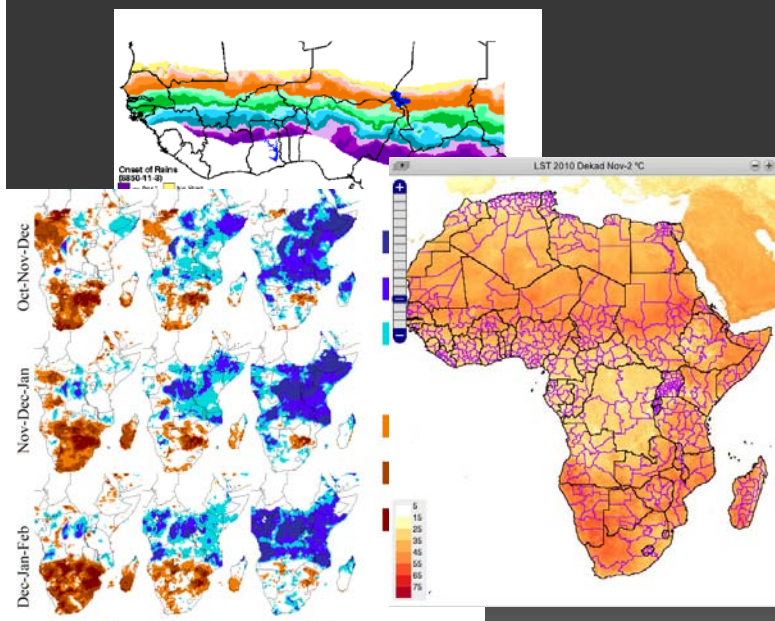
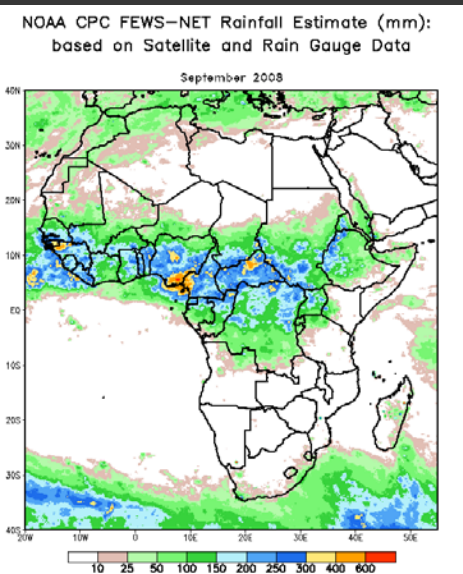
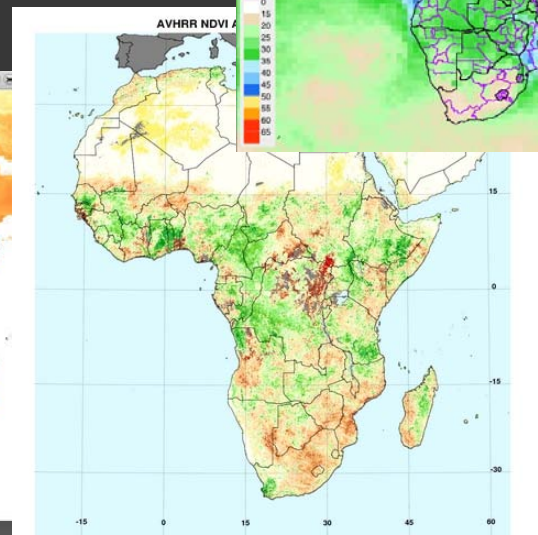
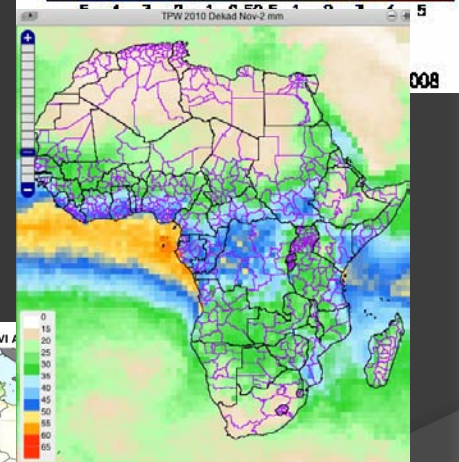
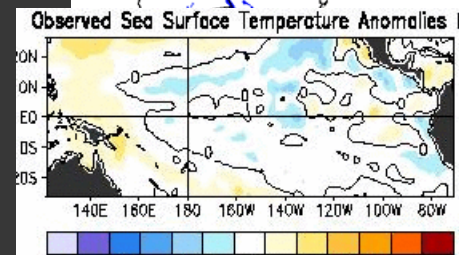
# Remote sensing provides an Objective Analysis of Hazards for Earlier Early Warning

- Problem specification: identification of potential changes in:
  - Agricultural production (veg., rain, yields)
  - Value of Assets (livestock through rangeland, market information)
- Remote sensing provides information on both cropped area and yield estimates
- It is the least controversial information on production

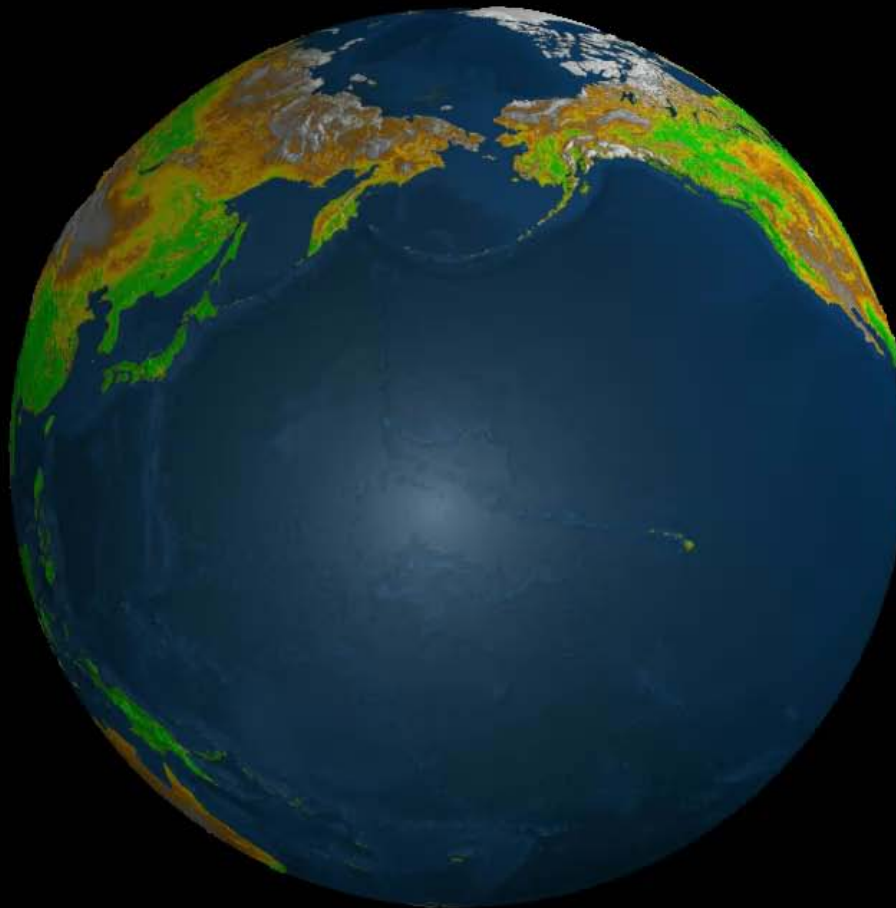




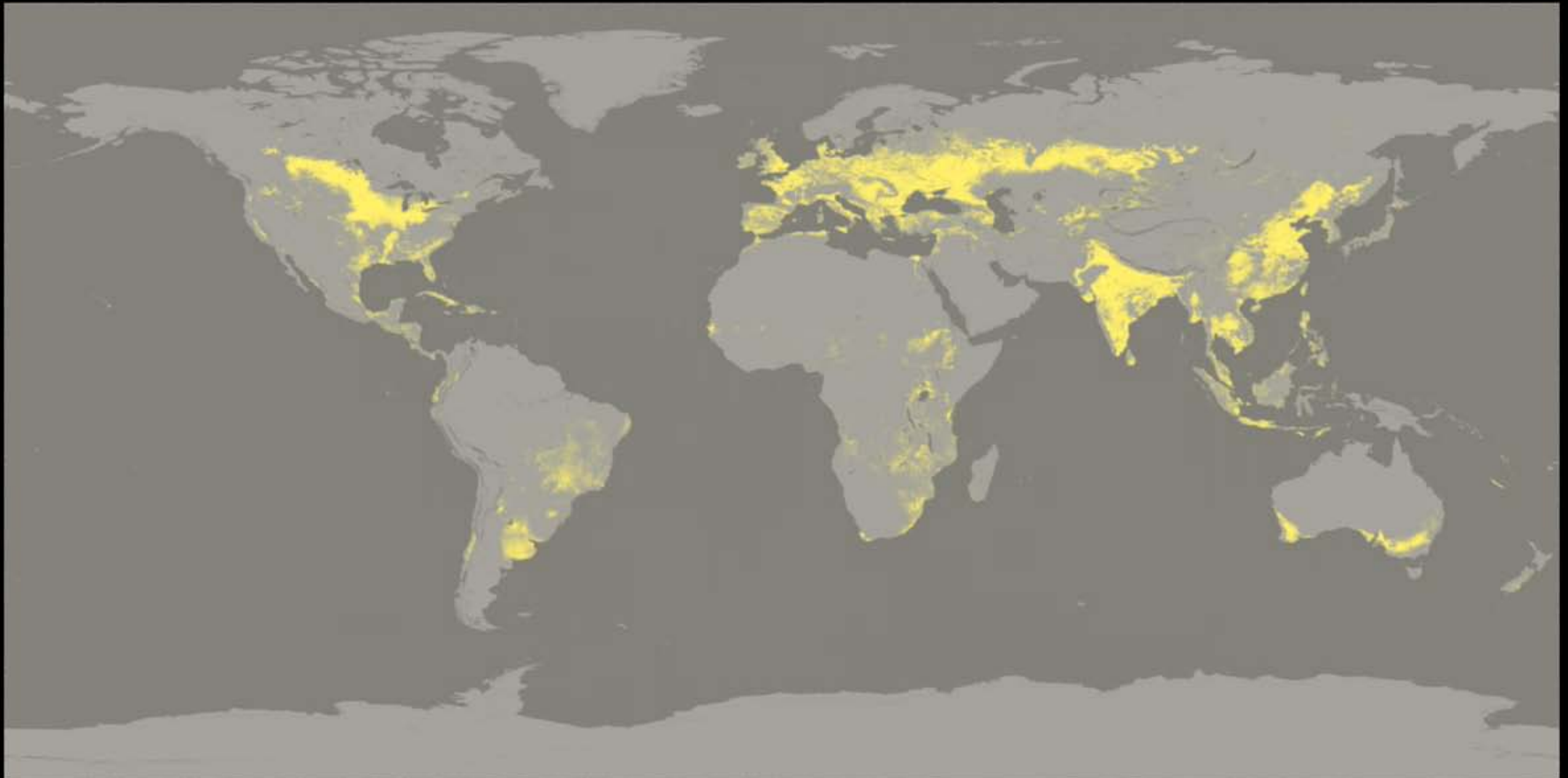
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# Satellite Data for Drought Management



# NDVI for Wheat in Australia





# Conclusions

- Food production is critical to the basic food security of millions in Africa
- Remote sensing provides early warning of trouble (impending decline in production)
- Integrated observations and models will provide improved data tools for decision makers – enables the incorporation of non-biological factors into the model for more precise and specific information
- Improved coordination for decision support